Gregory S. Warrington

CURRICULUM VITAE   August 25, 2022

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EMPLOYMENT

Professor, University of Vermont	2020 – Present
Associate Chair, Department of Mathematics & Statistics	Fall 2014 – Spring 2021
	(on sabbatical Fall 2016 – Spring 2017)
Associate Professor, University of Vermont	2014 – 2020
Assistant Professor, University of Vermont	2009 – 2014
Assistant Professor, Wake Forest University	2004 – 2008
NSF Postdoctoral Fellow	
Wake Forest University	2006 – 2007
University of Pennsylvania	2003 – 2004
Visiting Assistant Professor, University of Massachusetts, Amherst	2001 – 2003

EDUCATION

Harvard University: Ph.D. in Mathematics	1996 – 2001
Advisor — Sara Billey, MIT	
Thesis — *Kazhdan-Lusztig polynomials, pattern avoidance and singular loci of Schubert varieties*	
Princeton University: B.A. in Mathematics, magna cum laude	1991 – 1995

GRANTS & FELLOWSHIPS

Simons Foundation Collaboration Grant	2017 – 2022
Title — *Rational Catalan Combinatorics and Quasisymmetric Functions*	
Award # 429570	
National Science Foundation Standard Grant	2012 – 2016
Title — *Combinatorial polynomials arising from representations*	
Award # DMS-1201312	
Simons Foundation Collaboration Grant	2011 – 2012
Title — *Combinatorial polynomials arising from representations*	
Award # 197419 (years 2–5 declined; predominantly travel support)	
NSA Young Investigators Grant	2008 – 2010
Title — *Combinatorics of diagonal harmonics and Kazhdan-Lusztig polynomials*	
Award # H98230-09-1-0023	
Wake Forest Sterge Faculty Fellowship	2006 – 2008
NSF Postdoctoral Fellowship	2003 – 2007
AMS Project NExT Fellowship	2002 – 2003

RESEARCH INTERESTS

Algebraic combinatorics
Symmetric and quasisymmetric functions, diagonal harmonics module,
Kazhdan-Lusztig polynomials, Schubert varieties, combinatorics of Weyl groups
Redistricting and voting
Quantifying asymmetry in district plans, combinatorics of district plans, ranked-choice voting
Public health/opioid use
Modeling

REFEREED RESEARCH PUBLICATIONS

Simulated Packing and Cracking
(with J. Buzas), *Election Law Journal, 20 (4) (Dec 2021).*

All hands-on deck and all decks on hand:
 Surmounting supply chain limitations during the COVID-19 pandemic
(with J.S. Warrington, J.W. Crothers, T. Hong, A. Goodwin, L. Coulombe,
 L. Bryan, V. Clark, L. Risley, C. Wojewoda, M. Fung, M. Lewis),
Academic Pathology, 8 (2021).

Abacus histories and the combinatorics of creation operators
(with N. Loehr), *J. Comb. Theory Series A, 177 (Jan 2021).*

Urinary Buprenorphine, Norbuprenorphine and Naloxone Concentrations and Ratios:
 Review and Potential Clinical Implications.
(with Jill S. Warrington, Samuel Francis-Fath, John Brooklyn),
Journal of Addiction Medicine, 14 (6) (Dec. 2020).
Contribution: Data analysis and visualization.

Use of urinary naloxone levels in a single provider practice: a case study
(with Jill S. Warrington, John Brooklyn, Samuel Francis-Fath),
Addiction Science & Clinical Practice, 15 (3) (2020).
Contribution: Data analysis and visualization.

Accumulation charts for instant-runoff elections
(with B. E. Tenner), *Notices of the Amer. Math. Soc., 66 (11), (Dec., 2019) 1793–1799.*

A comparison of partisan-gerrymandering measures
Election Law Journal 18 (3) (September 2019) 262–281.

Quasisymmetric and Schur expansions of cycle index polynomials
(with N. Loehr), *Discrete Mathematics 342 (1) (January 2019) 113–127.*

What are your patients using (and how do you know): Using clinical
 laboratory results to understand drug use patterns in a state-wide model
(with Jill S. Warrington), *poster presentation; 2018 PAINWeek Abstract Book*
Postgraduate Medicine 130 (1) (2018) 1–91.
Contribution: Data analysis.

Quantifying gerrymandering using the vote distribution
Election Law Journal 17 (1) (March 2018) 39–57.

Predicting effects of future development on a territorial forest songbird:
 methodology matters
(with Michelle Brown, Therese M. Donovan, Ruth Mickey, W. Scott Schwenk, David Theobald),
Landscape Ecology 33 (1) (January 2018) 93–108.
Contribution: Fourth author, data analysis.

**Orthogonal bases for transportation polytopes applied to Latin squares,
    magic squares and Sudoku boards**
Linear Algebra and its Applications 531 (October 2017) 285–304.

Shape and pattern containment of separable permutations
(with A. Crites, G. Panova), *Ars Combinatoria CXXVIII (July 2016) 103–116.*

Rational parking functions and Catalan numbers
(with D. Armstrong, N. Loehr), *Annals of Combinatorics 20 (1) (March 2016) 21–58.*

Sweep maps: A continuous family of sorting algorithms
(with D. Armstrong, N. Loehr), *Advances in Mathematics 284 (2015) 159-85.*

Martin Gardner's minimum no-three-in-a-line problem
(with A. Cooper, O. Pikhurko, J. Schmitt), *Amer. Math. Monthly 121 (3) (2014) 213–221.*

**Evaluation of Choosing Wisely cervical cancer screening guidelines at a rural
    tertiary academic medical center: How are we doing?**
(with S. Brownschidle, T. St. Johns, M. Fung, E. Everett, J. Warrington),
Journal of the American Society of Cytopathology 3 (5) (Sept.-Oct. 2014) S74–S75.
Contribution: Fifth author; data analysis.

**Transition matrices for symmetric and quasisymmetric
    Hall-Littlewood polynomials**
(with N. Loehr, L. Serrano), *J. Combinatorial Theory, Series A 120 (8) (2013) 1996–2019.*

On the existence of three-dimensional Room frames and Howell cubes
(with J. Dinitz, E. Lamken), *Discrete Mathematics 313 (12) (2013) 1368–1384.*

What to expect in a game of memory
(with D. Velleman), *American Mathematical Monthly 120 (9) (2013) 787–805.*

Estimating landscape carrying capacity through maximum clique analysis
(with T.M. Donovan, W.S. Schwenk, J.H. Dinitz),
Ecological Applications 22 (8) (2012) 2265–2276.
Contribution: Second author; data analysis.

Quasisymmetric expansions of Schur-function plethysms
(with N. Loehr), *Proceedings of the American Mathematical Society 140 (2012) 1159–1171.*

Equivalence classes for the μ-coefficient of Kazhdan-Lusztig polynomials in S_n
Experimental Mathematics 20 (4) (2011) 457–466.

The spectra of certain classes of Room frames: the last cases
(with J. Dinitz), *Electronic J. of Combinatorics 17 (1) (2010) Research Paper 74, 13 pp.*

**From quasisymmetric expansions to Schur expansions via
    a modified inverse Kostka matrix**
(with E. Egge, N. Loehr), *European Journal of Combinatorics. 31 (8) (2010) 2014–2027.*

A combinatorial version of Sylvester's four-point problem
Advances in Applied Mathematics 45 (3) (2010) 390–394.

A continuous family of partition statistics equidistributed with length
(with N. Loehr), *Journal of Combinatorial Theory, Series A 116 (2) (2009) 379–403.*

Nested quantum Dyck paths and $\nabla(s_\lambda)$
(with N. Loehr), *International Math. Research Notices (5) (2008) Art. ID: rnm157, 29pp.*

Bitableau bases for Garsia-Haiman modules of hollow type
(with E. Allen, M. Marion), *J. Combinatorial Theory, Series A 115 (7) (2008) 1127–1155.*

**A human proof for a generalization of Shalosh B. Ekhad's
    10^n Lattice Paths Theorem**
(with N. Loehr, B. Sagan), *Ars Combinatoria 89 (2008) 421–429.*

Square q, t-lattice paths and $\nabla(p_n)$
(with N. Loehr), *Trans. of the American Mathematical Society 359 (2) (2007) 649–669.*

Juggling probabilities
American Mathematical Monthly 112 (2) (2005) 105–118.

The combinatorics of a three-line circulant determinant
(With N. Loehr, H. Wilf), *Israel Journal of Mathmeatics 143 (2004) 141–156.*

Counterexamples to the 0-1 Conjecture
(With T. McLarnan), *Representation Theory 7 (2003) 181–195.*

A formula for inverse Kazhdan-Lusztig polynomials in S_n
Journal of Combinatorial Theory, Series A 104 (2) (2003) 301–316.

Maximal singular loci of Schubert varieties in $SL(n)/B$
(With S. Billey), *Trans. of the American Mathematical Society 355 (10) (2003) 3915–3945.*

Kazhdan-Lusztig polynomials for 321-hexagon-avoiding permutations
(With S. Billey), *Journal of Algebraic Combinatorics 13 (2001) 111–136.*

Combinatorics of multivariate chromatic polynomials for rooted graphs
(with N. Loehr), *submitted.*

ADDITIONAL CONTRIBUTIONS

Interactive viewer for Accumulation Charts
`https://gswarrin.w3.uvm.edu/accumulation-chart/accumulation-chart.html`

Packed voters and cracked voters
`https://arxiv.org/abs/1806.11074`

**Gerrymandering and the net number of US House seats won
   due to vote-distribution asymmetries**
(with J. Buzas), `https://arxiv.org/abs/1707.08681`

Optimized random chemistry
(with J. Buzas), `http://arxiv.org/abs/1302.2895`

Cyballs: Cyborg juggling balls
`http://www.cems.uvm.edu/~gswarrin/cyballs/index.html`

KLC: Computer code and database for Kazhdan-Lusztig polynomials
`http://www.cems.uvm.edu/~gswarrin/research/klc/klc.html`

A photographic assignment for abstract algebra
PRIMUS 19 (6) (2009) 561–564.
Peer reviewed paper on pedagogy.

Juggling performers + Math = ?
Math Horizons 15 (3) (Feb. 2008) 18–20.
Invited, non-research contribution; not peer reviewed.

GERRYMANDERING RESEARCH: IMPACT & COVERAGE

The declination metric for gerrymandering has appeared in the following federal cases:

Plaintiff's Motion for Temporary Injunction
Derrick Graham et al. v. Michael Adams et al., 2021 (Kentucky).

Complaint
League of Women Voters of Ohio v. Ohio Redistricting Commission, 2021.

Expert witness testimony
Householder v. Ohio A. Philip Randolph Institute, 373 F. Supp. 3d 978 (S.D. Ohio 2019).

I was interviewed about my work on WCAX on March 22, 2018.

TEACHING

Development of Mathematics	20{20,21,22}
Topics in combinatorics	20{06,08,10,12,13,16,21}
Groups & Rings	20{07,08,11,12,18,20,21,22}
First-semester combinatorics	20{09,10,17,21,22}
Discrete Structures (through Dept. of Computer Science)	2019
Junior-senior seminar	2018
Third-semester calculus	20{07,10,11,18}
Representation theory of the symmetric group (Independent study)	2015
Differential geometry	2015
Linear algebra	2013 & 2014
Graph theory	2005 & 2011 & 2014
Abstract algebra	2014
Masters seminar	2013
Algebraic graph theory (Independent study)	2010 & 2011
Combinatorial geometry (Independent study)	2011
Concrete mathematics (Independent study)	2010
The history and ethics of measurement (First-year seminar)	2006
Discrete mathematics	2003 & 2005
Second-semester calculus	1999 – 2005
Fundamental concepts in mathematics	2002
First-semester calculus	1998 – 2002
Representation theory (Junior seminar)	2001

SERVICE

Department

Promotion and Reappointment Comm. (chair)	Fall 2022 – Present
Reappointment Comm. (chair)	Fall 2022 – Present
Promotion Comm. (chair)	Fall 2022 – Present
Graduate Comm.	Fall 2012 – Spring 2014, Fall 2021 – Spring 2022
Math & Stats Chair Search Committee	Spring 2021
GTA Committee (chair)	Spring 2021
Associate Chair	Fall 2017 – Spring 2021
Assessment Coordinator	Fall 2017 – Spring 2021
GIV Advisory Board	Spring 2015 – Spring 2021
Tenure-track Search (chair)	Fall 2018 – Spring 2019
Undergraduate Curriculum Comm. (chair)	Fall 2017 – Spring 2018
Undergraduate Curriculum Comm. (chair)	Fall 2015 – Spring 2016
Tenure-track Search	Fall 2015 – Spring 2016
Associate Chair	Fall 2014 – Spring 2016
Tenure-track Search (chair)	Fall 2014 – Spring 2015
Math Club Comm.	Fall 2011 – Spring 2014
Vision Comm. (chair)	Fall 2013
Peers & Aspirants Comm.	Fall 2013
Lecturer Reappointments	2012
Colloquium Comm.	Fall 2010 – Spring 2012
Undergraduate Curriculum Comm.	Fall 2010 – Spring 2012

Faculty Evaluation Guidelines Comm.	Fall 2009 – Spring 2010
Masters Oral Exam	Spring 2010 & 2012

College of Engineering & Mathematical Sciences

College Curriculum Comm. (chair)	Fall 2022 – Present
Facilities Comm.	Fall 2010 – Spring 2016
Research talk to CEMS Board of Advisors	Spring 2012

University

Natural Sciences Gen Ed Ad Hoc Committee	Spring 2020
CEMS Dean Search Committee	Fall 2017 – Spring 2018
IBB Cost Pool Methodology Subcommittee	Fall 2013 – Spring 2014
Faculty Senator	Fall 2013 – Spring 2014
Juggling Club, Faculty Advisor	Fall 2009 – Spring 2014

Profession

Reviewer for Math Reviews	2004 – 2021
FPSAC 2017 (London, UK) Program Comm.	2016 – 2017
AMS-Simons Travel Grants Comm.	2014 – 2017
Book reviewer	2015 & 2019
NSF Panelist (combinatorics)	2014
NSA Discrete Mathematics Panelist	Fall 2012 – Spring 2014
Minisymposium organizer: SIAM Discrete Mathematics	2004

Referee for

Adv. in App. Math.	Exp. Math.
Adv. in Math.	FPSAC 20{02,17,20}
Alg. Comb.	J. of Alg.
Amer. Math. Monthly	J. of Alg. Comb.
Annals of Comb.	J. of App. Prob.
Austral. J. Comb.	J. of Comb.
Canad. J. Math.	J. of Comb. Theory, Ser. A
Comb. Theory	J. of Int. Seq.
Disc. App. Math.	Math. Mag.
Disc. Math.	Notices of AMS
Elec. J. Comb.	Proc. of the AMS
Elec. Law J.	SIAM J. Disc. Math
Enum. Comb. and App.	Trans. of the AMS
Europ. J. Comb.	NSA-AMS Grant Program

PH.D. DISSERTATION COMMITTEES

Nadia Lafrenière (Univ. Québec, Montréal)	2019
Louis-Francois Preville-Ratelle (Univ. Québec, Montréal)	2012
Matt Welz	2009 – 2012
Paige Rinker (Dartmouth)	2011
Kirsten Stor	2010
Melanie Brown	2010

PH.D. ADVISING

Keith Sullivan	2022 – Present
Michael Drennan	2021 – Present
Ada Morse (co-advisor)	2018

MASTERS THESIS COMMITTEES

Jo Martin	2020
Ben Emery	2019
Wendy Cole (Rubenstein School)	2013

UNDERGRADUATE & MASTERS THESES ADVISED

Jonathan Godbout (Masters)	Fall 2012 – Spring 2013
Alli Morse (Undergraduate)	Fall 2011 – Spring 2012

INVITED TALKS

Does it matter how we quantify gerrmandering?
Electoral Innovation Lab Seminar, Princeton University   2021

[Canceled due to pandemic]
Algebraic Combinatorics workshop at KTH (Stockholm, Sweden)   2020
AMS Special Session on Rep. Theory and Alg. Geometry (Charlottesville, VA)   2020
AMS Special Session on The Mathematics of Redistricting (Charlottesville, VA)   2020

Creation operators for Hall-Littlewood polynomials
Garsia Fest — Adriano Garsia 90th Birthday Conference (La Jolla, CA)   2019

Math and gerrymandering
Binghamton University Combinatorics Seminar (Binghamton, NY)   2019

Quasisymmetric functions in algebraic combinatorics
30th Cumberland Conference (Huntington, WV)   2018

Mathematical analyses of gerrymandering
Davidson College, Bernard Public Lecture   2017

What to expect in a game of memory
Virginia Tech, Combinatorics Seminar   2017

Orthogonal bases for transportation polytopes
University of Washington, Combinatorics Seminar   2017

Quasisymmetric expansions of cycle indices
AMS Special Session on the Combinatorics of Symmetric Functions (Brunswick, ME)   2016
AMS Special Session on Plethysm and Kronecker Products (Athens, GA)   2016

Combinatorics of the rational Catalan
University of Notre Dame, Discrete Math Seminar   2016

Rational q, t-Schröder numbers
York University, Applied Algebra Seminar   2015

Rational q-Catalan numbers and q-binomials
AMS Special Session on Generalized Catalan Algebraic Comb. (Halifax, NS)   2014

Crosshatch permutations
AMS Special Session on Geometric Applications of Alg. Comb. (Baltimore, MD)   2014

The sweep map
CMS Special Session on Symmetric Functions and Generalizations (Ottawa, CA)   2013

Quasisymmetric expansions of Schur plethysms
AMS Special Session on Symmetric Functions (Washington, DC)   2012

Quasisymmetric expansions
Combinatorial algebra meets algebraic combinatorics (Montréal, Québec)   2012

On the μ-coefficients of Kazhdan-Lusztig polynomials
University of Massachusetts, Amherst; Representation Theory Seminar   2012
AMS Special Session on Combinatorics of Coxeter Groups (Worcester, MA)   2011

Quasisymmetric expansions of symmetric functions
AMS Special Session on Combinatorial Representation Theory (Worcester, MA)   2011
LaCIM, Montréal, Québec   2011
MIT, Combinatorics Seminar   2010

On the shape of separable permutations
AMS Special Session on Algebraic and Topological Combinatorics (South Bend, IN)   2010

Infinitely many new partition statistics
AMS Special Session on the Combinatorics of Symmetric Functions (Minneapolis, MN) 2010
AMS Special Session on Algebraic Combinatorics (State College, PA)   2009

Statistics in combinatorics
MAA MathFest Invited Speaker   2009

A combinatorial version of Sylvester's four-point problem
Dartmouth College, Combinatorics Seminar   2009
MAA MathFest Session on "Gems in Combinatorics"   2009

Bitableau bases for Garsia-Haiman modules of hollow type
AMS Special Session on Rings, Algebras and Varieties in Comb. (Raleigh, NC) 2009

Kazhdan-Lusztig polynomials of maximum possible degree
AMS Special Session on Computational Methods in Lie Theory (Raleigh, NC)   2009

Combinatorial structures associated to the nabla operator
Banff International Research Station (Banff, Alberta; Jim Haglund, proxy speaker) 2007

Combinatorial aspects of $\nabla(s_\lambda)$
Centre de Recherches Mathématiques (CRM), (Montréal, Québec)   2007

Counterexamples to the 0-1 Conjecture
Yale University, Algebra Seminar   2004
MIT, Combined Lie Groups/Combinatorics Seminar   2002
CRM, Conference on Computational Lie Theory   2002

Towards pictures of Kazhdan-Lusztig polynomials
SUNY Albany, Discrete Math Day   2002

Properties of Betti numbers of Schubert varieties
AMS Special Session on Algebraic Combinatorics (Ann Arbor, MI)   2002

CONTRIBUTED TALKS

Combinatorics of the rational Catalan
UVM, Combinatorics Seminar   2019

Merry Deranging: Gerrymandering
UVM Colloquium   2018

A combinatorial version of Sylvester's four-point problem
Amherst College, Colloquium   2013
UVM, Applied Combinatorics Seminar   2009

A photography assignment for abstract algebra
AMS-MAA Joint Meetings, MAA Session   2012

Standardizations of symmetric functions
UVM, Combinatorics Seminar   2012

Separable permutations and Greene's Theorem
UVM, Combinatorics Seminar   2011

Quasisymmetric expansions of symmetric functions
Banff International Research Stations (Banff, Alberta)   2010

Quasisymmetric functions and the inverse Kostka matrix
UVM, Combinatorics Seminar   2010

Catalan polynomials
Middlebury College, Colloquium   2010

Infinitely many new partition statistics
Discrete Mathematics of New England   2009

Points, planes and permutations
Middlebury College, Colloquium   2009

Kazhdan-Lusztig polynomials of maximum possible degree
UVM, Applied Combinatorics Seminar   2009

$(0, 1, q)$-Permutations
University of Pennsylvania, Combinatorics Seminar   2004
University of Washington, Combinatorics Seminar   2003

Ribbon tableaux and Kazhdan-Lusztig polynomials
University of Pennsylvania, Combinatorics Seminar   2004

Counterexamples to the 0-1 Conjecture
Yale University, Algebra Seminar   2004
MIT, Combined Lie Groups/Combinatorics Seminar   2002
CRM, Conference on Computational Lie Theory   2002

An overview of Kazhdan-Lusztig polynomials
University of Pennsylvania, Combinatorics Seminar   2003

Maximal singular loci of Schubert varieties in $SL(n)/B$
University of Massachusetts, Amherst; Representation Theory Seminar   2001
University of Michigan, Combinatorics Seminar   2000

Kazhdan-Lusztig polynomials and 321-hexagon-avoiding permutations
AMS Special Session in Honor of G.-C. Rota (Washington, DC)   2000

"MATHEMATICS OF JUGGLING" TALKS

Juggling probabilities/Mathematical juggling in the 21st century
SUNY Plattsburgh, Pi Mu Epsilon Induction Ceremony   2019
Governor's Institute of Vermont   20{09,13,18,22}
Davidson College, Bernard Lecturer   2017
University of Notre Dame, Math for Everyone Series   2016

Moravian College, Student Research Conference	2015
MAA/NES Spring Meeting	2014
National Museum of Mathematics MOVES Conference	2013
UVM Honors College Seminar: Mathematics and the Arts	2013
Missisquoi Middle School students	2012
MATHCOUNTS	2012
North Carolina Governor's School	2005 − 2007
James Madison University, SUMS Conference	2005
EDGE Program, Greensboro, NC	2005
University of Georgia, VIGRE Seminar	2005
University of North Carolina, Charlotte, Super Competition	2005
Appalachian State University, Colloquium	2004
Davidson College, Math Coffee	2004
Yale University, Colloquium	2004
St. Michael's College, Colloquium	2003

Mathematics of juggling (* – with A. Knutson)

University of Massachusetts, Amherst, Colloquium*	2002
MIT Museum, Family Day	2001
Haverford College, Colloquium*	1999
MIT, Applied Mathematics Colloquium*	1999
The Math Circle, Boston, MA	1998
IAS/PCMI Representation Theory Summer Session*	1998

Juggling and Markov chains

Dartmouth College, Discrete Math Day	2002